

What is claimed is:

1 1. A seek-servo apparatus of a hard disk drive capable of moving a head to a desired track
2 location, the seek-servo apparatus comprising an actuator which moves the head to the desired track
3 location in response to an acceleration command having a target acceleration which leads a target
4 velocity and a target position by a predetermined time.

1 2. The seek-servo apparatus of claim 1, wherein the predetermined time includes the time
2 that it takes to compute the acceleration command and the time that it takes for the actuator to vary
3 a torque of the head in response to the computed acceleration command.

1 3. The seek-servo apparatus of claim 1 further comprising:
2 an adding/subtracting unit which subtracts a feedforward acceleration of the head from a
3 result of adding a velocity correction value to the target acceleration, and which outputs a result of
4 subtraction as the acceleration command; and
5 an estimator which estimates the feedforward acceleration of the head based on the
6 acceleration command and position information concerning a position of the head moved;
7 wherein the actuator outputs the position information to the estimator.

1 4. The seek-servo apparatus of claim 3, wherein the velocity correction value is obtained by

2 adding a position correction value to the target velocity, subtracting an estimated actual velocity of
3 the head from a result of adding the position correction value to the target velocity, and
4 proportionally integrating a result of subtracting the estimated actual velocity of the head from a
5 result of adding the position correction value to the target velocity; and

6 wherein a position correction value is obtained by subtracting an estimated actual position
7 of the head from the target position and proportionally integrating a result of subtracting the
8 estimated actual position of the head from the target position; and

9 wherein the estimator estimates an actual velocity and an actual position based on an
10 acceleration command output from the adding/subtracting unit and a position information output
11 from the actuator.

12 5. The seek-servo apparatus of claim 4, wherein the actuator comprises:

2 a delayer which delays an acceleration command output from the adding/subtracting unit for
3 the predetermined time and outputs a result of delaying the acceleration command;

4 a first integrator which integrates the result of delaying the acceleration command and
5 outputs a result of integration; and

6 a second integrator which integrates the result of integration and then outputs an integrator
7 result as the position information to the estimator.

1 6. The seek-servo apparatus of claim 3, wherein the actuator comprises:

a delayer which delays an acceleration command output from the adding/subtracting unit for the predetermined time and outputs a result of delaying the acceleration command;

a first integrator which integrates the result of delaying the acceleration command and outputs a result of integration; and

a second integrator which integrates the result of integration and outputs an integrator result as the position information to the estimator.

7. The seek-servo apparatus of claim 6, wherein the target acceleration is derived by the equation

$$a_w(n+1) = \frac{2\pi X_{SK}}{N_{SK}^2 T_{SM}^2} \sin \frac{2\pi(n+1)}{N_{SK}}$$

where $a_w(n+1)$ represents the target acceleration, n represents a servo sample number, X_{SK} represents a seek length, and N_{SK} represents a seek time per a sample; and

wherein the target velocity is derived by the equation

$$v_w(n) = \frac{X_{SK}}{N_{SK} T_{SM}} [1 - \cos(\frac{2\pi n}{N_{SK}})]$$

6 where $v_w(n)$ represents the target velocity and T_{SM} represents a servo sampling time; and

7 wherein the target position is derived by the equation

$$y_w(n) = \frac{X_{SK}}{N_{SK}}n - \frac{X_{SK}}{2\pi} \sin \frac{2\pi n}{N_{SK}}$$

8 where $y_w(n)$ represents the target position.

1 8. The seek-servo apparatus of claim 5, wherein the target acceleration is derived by the
2 equation

$$a_w(n+1) = \frac{2\pi X_{SK}}{N_{SK}^2 T_{SM}^2} \sin \frac{2\pi(n+1)}{N_{SK}}$$

3 where $a_w(n+1)$ represents the target acceleration, n represents a servo sample number, X_{SK} represents

4 a seek length, and N_{SK} represents a seek time per a sample; and

5 wherein the target velocity is derived by the equation

$$v_w(n) = \frac{X_{SK}}{N_{SK} T_{SM}} [1 - \cos(\frac{2\pi n}{N_{SK}})]$$

where $v_w(n)$ represents the target velocity and T_{SM} represents a servo sampling time; and

wherein the target position is derived by the equation

$$y_w(n) = \frac{X_{SK}}{N_{SK}}n - \frac{X_{SK}}{2\pi} \sin \frac{2\pi n}{N_{SK}}$$

where $y_w(n)$ represents the target position.

9. The seek-servo apparatus of claim 2, wherein the predetermined time is equivalent to a unit servo sample.

10. The seek-servo apparatus of claim 1, wherein the actuator comprises:
a delayer which delays an acceleration command output from the adding/subtracting unit for the predetermined time and outputs a result of delaying the acceleration command;
a first integrator which integrates the result of delaying the acceleration command and outputs a result of integration; and
a second integrator which integrates the result of integration and then outputs an integrator result as the position information to the estimator.

11. The seek-servo apparatus of claim 1, wherein the target acceleration is derived by the

2 equation

$$a_w(n+1) = \frac{2\pi X_{SK}}{N_{SK}^2 T_{SM}^2} \sin \frac{2\pi(n+1)}{N_{SK}}$$

3 where $a_w(n+1)$ represents the target acceleration, n represents a servo sample number, X_{SK} represents
4 a seek length, and N_{SK} represents a seek time per a sample.

1 12. The seek-servo apparatus of claim 1, wherein the target velocity is derived by the
2 equation

$$v_w(n) = \frac{X_{SK}}{N_{SK} T_{SM}} [1 - \cos(\frac{2\pi n}{N_{SK}})]$$

3 where $v_w(n)$ represents the target velocity and T_{SM} represents a servo sampling time.

1 13. The seek-servo apparatus of claim 1, wherein the target position is derived by the
2 equation

$$y_w(n) = \frac{X_{SK}}{N_{SK}} n - \frac{X_{SK}}{2\pi} \sin \frac{2\pi n}{N_{SK}}$$

3 where $y_w(n)$ represents the target position.

1 14. A seek-servo method, comprising the stpes of:

2 providing a head in a hard disk drive, and

3 moving the head to a desired track location using an acceleration command having a target
4 acceleration which leads a target velocity and a target position by a predetermined time.

15. The method of claim 14, wherein the predetermined time includes the time that it
2 takes to compute the acceleration command and the time that it takes to vary the torque of the head
3 in response to the computed acceleration command.

16. The method of claim 14, wherein the acceleration command is obtained by
2 subtracting a feedforward acceleration of the head from a result of adding a velocity correction value
3 to the target acceleration, and wherein the feedforward acceleration of the head is estimated based
4 on the acceleration command and position information concerning a position of the head moved.

1 17. The method of claim 16, wherein the velocity correction value is obtained by adding a
2 position correction value to the target velocity, subtracting an estimated actual velocity of the head
3 from a result of adding the position correction value to the target velocity, and proportionally
4 integrating a result of subtracting the estimated actual velocity of the head from a result of adding
5 the position correction value to the target velocity; and

wherein a position correction value is obtained by subtracting an estimated actual position of the head from the target position and proportionally integrating a result of subtracting the estimated actual position of the head from the target position; and

wherein an actual velocity and an actual position are estimated based on an acceleration command output and a position information output.

18. The method of claim 14, wherein the target acceleration is derived by the equation

$$a_w(n+1) = \frac{2\pi X_{SK}}{N_{SK}^2 T_{SM}^2} \sin \frac{2\pi(n+1)}{N_{SK}}$$

where $a_w(n+1)$ represents the target acceleration, n represents a servo sample number, X_{SK} represents a seek length, and N_{SK} represents a seek time per a sample.

19. The method of claim 14, wherein the target velocity is derived by the equation

$$v_w(n) = \frac{X_{SK}}{N_{SK} T_{SM}} [1 - \cos(\frac{2\pi n}{N_{SK}})]$$

where $v_w(n)$ represents the target velocity and T_{SM} represents a servo sampling time.

20. The method of claim 14, wherein the target position is derived by the equation

$$y_w(n) = \frac{X_{SK}}{N_{SK}} n - \frac{X_{SK}}{2\pi} \sin \frac{2\pi n}{N_{SK}}$$

2 where $y_w(n)$ represents the target position.